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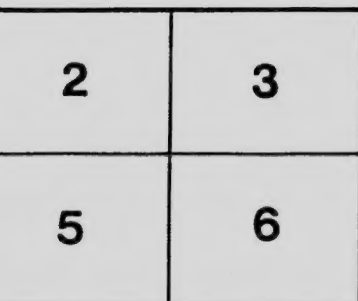
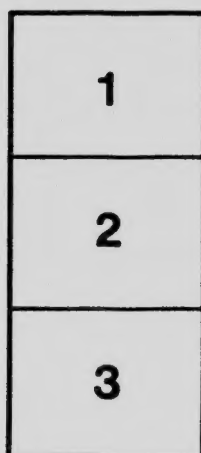
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PROVINCE OF BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE
(HORTICULTURAL BRANCH).

Top-working of Fruit-trees and Propagation.

THE great number of different varieties of fruit-trees planted in most sections and their inadaptability to the section, in many instances, has led to numerous inquiries *re* top-working with a view to changing certain unsuitable varieties to something more profitable.

Time to Top-work.

Grafting is always done in the spring, just as growth is starting. When budding is used, it is done just when buds are fairly well developed, in July or August in British Columbia. It is usually better to err on the early side rather than the late in either grafting or budding.

Methods used in Top-working.

There are many different ways in which top-working can be done, but the cardinal point with all of them is to make sure that the cambium (growing layer just between the bark and the wood) of the stock and scion or bud come into contact with each other, so that they will unite.

The following are the most common methods of top-working:—

Bark-grafting.—This is the quickest, easiest, and most sure grafting to do. It consists of choosing a flat portion of the branch which has been cut back to be grafted, making a cut about an inch long through the bark and raising the two corners. The scion (about 4 inches in length), which is made with a sloping cut on one side only, is then

shoved down under the bark, with the cut side towards the wood. The graft is waxed and tied with a piece of cloth to hold it in place until a union is completed, after which the cloth should be slit on one side with a knife and allowed to gradually force itself off by growth expansion. (See cut.)



Showing method of cutting and inserting scions for bridge-grafting on left, and bark-grafting centre and right. At top is shown whip-and-tongue graft untied.

Cleft-grafting.—This form is commonly made use of in top-working fruit-trees. It has one bad feature, in that the stock has to be split, which often leads to decay. It is difficult to work wood heavier than 2 to 3 inches in diameter. The scion used should be about 4 inches in length and cut to a wedge shape, a little thicker on the outside, so that the pressure will be sure to come where the union should take place. By cutting the scion with the bud in the centre of the cut a circular side to the scion is obtained, and thus the scion when inserted

is more likely to strike a union. The scions are sometimes put in with a slight slope in order to ensure a union between the two. Special tools are also sometimes used for splitting the stock where much grafting is being done.

Whip-and-tongue graft.—This is performed by making corresponding sloping cuts on the stock and scion and making an inscion or tongue cut in the centre of the stock and scion, downwards in the stock and upwards on the scion, and then shoving them into each other.



Showing method of waxing grafts and wrapping same with cloth. At top whip-and-tongue graft tied. At extreme right is shown roll of grafting-wax.

This graft is used almost exclusively in nursery practice, but it is used to some extent in working over small trees; it cannot be well practised on limbs larger than $\frac{3}{4}$ inch in diameter. The important point here is to have at least one side of the scion and stock in contact one with the other. In nursery practice the grafts are just tied with cotton string or raffia and the union buried when set out; but where the grafting is done above ground, grafting-wax or cloths which have been dipped in wax should be used to protect the graft. (See cut.)

Budding.—With stone-fruits, such as peaches, apricots, cherries, plums, etc., better results are usually obtained by budding rather than by grafting. Budding is best done on present year's wood, and if the trees to be worked over are large they should be cut back and budded on the new shoots that spring from the cut-back branches; often these trees are grafted, and, should the grafts not take, budding is practised on the new shoots which naturally grow due to the severe cutting-back.

Scions and Buds.

The most important feature in grafting and budding is the character of the scion-wood or buds selected. Scions should be cut from well-matured, hard, one-year-old wood with well-developed buds. Immature or overgrown wood is often the cause of failure in grafting, so also are immature or poorly developed buds in budding. The central part of a branch is the best to use for both scions or buds.

It is usually best, where possible, to cut the scions or bud stocks just as they are to be used. If it is necessary to cut scions before they are required, they should be cut when the wood is well ripened; they should not be cut when the frost is in them. Scion-wood, if cut early, should be stored in moist sand or sawdust in a cool cellar, or buried in the ground out of the reach of frost. Wood for budding should have the leaves cut off (leaving a little of the stalk for a handle) and be kept moist until used.

Waxes.

There are a great many different kinds of wax used in grafting, but the best the writer has used is one which is always ready, as it requires no heating in applying except the heat of the hand on a warm day. It is made as follows: 2 lb. of resin, 1 lb. of beeswax, and $\frac{1}{2}$ pint of raw or red linseed-oil. Melt the resin and beeswax, then add the oil, heat and stir; pour it into a can of cold water, grease your hands and pull it until all the lumps are well worked out and the wax a light colour. Roll in a piece of cloth and it is ready for use. Wax properly made can be kept for use as required.

Harder grafting-waxes are often used, but they have to be applied warm, usually with a paint-brush. The following is good: Melt 5 lb. of resin and 1 lb. of beeswax together, and then add $\frac{1}{2}$ lb. of powdered charcoal, and stir briskly to avoid lumps; then add $\frac{1}{4}$ pint of raw linseed-oil. After the oil has been stirred in well, the mixture may be poured into greased pans and allowed to cool. To use, melt and apply with brush.

In applying the wax to the graft, it should be well worked in around the scion and over the top of the stock to keep them from drying out. A little wax should be applied to the top of the scion. Wax is often

wasted by applying too much to the graft; all cut parts should be well covered with a thin coating, sufficient to keep out water and prevent drying-out.

After Handling of Grafts.

Usually two or more scions are inserted into each stock where bark- or cleft-grafting is used. Very often all of these scions will grow and it becomes necessary to remove all excepting one; this is done by cutting off the stub in line with the one scion left, or at least with a good long slope. This cut should be waxed over. It is also advisable to support for a time the single scion against winds, etc., by means of a stick tied to the stock and the scion.

Selection of Branches to Graft.

The selection of branches to work on is important. It is always best to select a branch of good growth in preference to a stunted slow-growing branch. Usually our young trees have been allowed to grow too many branches, so that by selecting and grafting three of the best outside limbs and a central leader the whole tree can be worked over in one year. In some cases, with old trees it will be better to take two or three years to complete the top-working in order to prevent too great a shock to the tree or flooding of the scions. With young trees up to 2 inches in diameter, it is best to cut the trunk off at about 10 inches from the ground and graft at this point; in this way the height of the head can be kept down.

One of the drawbacks to top-working is that the head of the tree is apt to become too high unless this is guarded against. Therefore, in selecting your branches to graft, choose those coming at a good angle from the trunk and insert the grafts as low as possible on these.

In old, large trees it will pay to take a chance in working over the trunk about 10 inches from the ground if the original top should be faulty. Use the bark-graft and allow all growth to remain the first year to take up surplus sap and nourish the root.

Bridge-grafting.

This is sometimes used where large trees have been girdled by mice or rabbits to such an extent that there is no actual tissue left from which to grow a new bark. In these cases the extremities of the girdling are smoothed off and scions cut 2 inches, or so, longer than the bridge; both ends are cut with a sloping cut and inserted under the bark at each end of the bridge. The ends should be well waxed and a binding placed around the trunk to keep them tightly in place. The top should be well pruned back to give the grafts a chance.

This grafting is only made use of in the case of valuable trees of a good size; with young trees it is usually advisable to cut the top off and allow them to shoot up from below. (*See cut.*)

Propagation, General.

Wood-cuttings.—This method of propagation is practised with all currants, grapes, gooseberries, willows, poplars, etc. Obtain in the fall or spring well-matured wood of the previous season's growth. It is preferable to gather this in the fall, as, if the buds are allowed to swell, the results will not be as good. Cut this wood into lengths of 7 to 10 inches, according to the distance apart the buds are on the cuttings. Cut the lower end off square just below a bud and leave an inch of wood above the upper bud on the cutting. Tie these cuttings in bundles, and store them, preferably upside down, in moist sand or sawdust in a cool cellar. The cuts will have callused during the winter, and when set out in the spring will start growth immediately. In planting in the nursery row, plant them about 4 inches apart in rows. Leave one or two buds above the surface of the soil and pack the earth well around the cuttings.

Mound-layering.—This is practised with gooseberries, currants, etc. It consists in cutting back and mounding up the bush in the spring or summer with earth until the greater part of the bush is covered. This banking of earth causes the lower branches to take root. These are cut away from the main bush and made use of in setting out new plantations.

Tipping.—This is practised to propagate the black-cap raspberries, dewberries, logans, etc. The plants produce long, drooping branches, which bend over and touch the ground. These tips will often take root themselves, but they are more liable to root if a little soil is thrown over them about August or September. These tips when rooted are severed from the parent plants and serve as new plants.

Root-cuttings.—This is practised with blackberries, logans, dewberries, etc. Dig up the medium-sized roots in the fall or spring of the year and cut them into lengths of 2 or 3 inches. Plant these out 2 inches deep and 3 to 4 inches apart in well-prepared soil.

Suckering.—This is the method by which the red raspberries are usually propagated. The suckers or sprouts are dug from among the bearing patch either in the fall or spring of the year. These will serve for use in the new patch.

Runners.—Strawberries are propagated from runners. These can be made to root quicker in some soils by covering the joints of the runners with a little soil, or by placing a stone on them near the joints.

Seeds.—The stock which is used in the propagation of the tree-fruits is grown principally from seed and is called a seedling. The seeds are either sown in the fall or they are stratified (frozen) in boxes of sand during the winter, and then sown in the spring.

New varieties of apples, pears, peaches, currants, berries, etc., can be grown from the seed of the fruit or berries. It is seldom that a good variety is obtained in this manner. Many of the shade and ornamental trees, such as maples, oaks, elms, locust, catalpa, ash, and evergreens, can be grown from the seed. The evergreens are rather difficult to start, as the seedlings require shade, etc., but they can be grown by using proper care.

Grades of One-year-old Stock and their Propagation.

Nursery stock (large fruits) is graded and sold according to the standard height of the trees for the particular variety. Trees are either propagated by grafting or budding.

ONE-YEAR-OLD GRAFTED STOCK.

The seedlings for grafting are dug in the fall, grafted during the winter, and set out in the spring. These grafts after one season's growth are sold as one-year-old grafts, and consist of a one-year-old top on two-year-old roots. The tops of these trees are generally unbranched.

ONE-YEAR-OLD BUDDED STOCK.

The seedlings for budding are either left in the nursery row all winter, or are dug up in the fall and stored and set out in the spring. These are budded during July or August. The buds do not make any growth the same season as budded, but remain dormant until spring, when the tops of the trees are cut off just above the inserted bud. After one season's growth from this bud, the stock is sold as one-year-old budded stock, and consists of a one-year-old top on a three-year-old root. These trees are stronger than the one-year-old grafts, and are generally more or less branched. Nearly all our stone-fruits and a great many of our apples and pears are propagated in this manner.

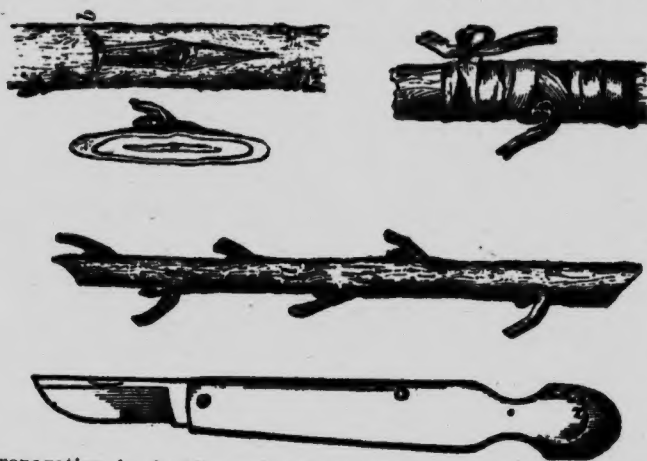
CUT-BACK GRAFTS.

There is still another class of tree which is sold by nurserymen, and which is known as the one-year-old cut-back graft. This stock is obtained by cutting back the one-year-old graft in the spring to the lowest bud on the previous season's growth, and then allowing this tree to grow another season in the nursery row. At the end of the season the stock is sold as one-year-old cut-back stock, and consists

of a one-year-old top on a three-year-old root system. These cut-back grafts are similar to the budded tree, except that they have a greater development of side branches, which is a great advantage in forming the head of the tree. This factor will be more fully dealt with under pruning the tree at the time of planting.

Budded versus Grafted Trees.

There is a difference of opinion as to which is the better to plant, the grafted or budded tree. Possibly the grafted tree is a little more hardy than the budded tree, because the seedling part of the grafted tree is buried in the ground. It is a noticeable fact that in the nurseries the seedling trees will be killed down during a hard winter, while the propagated stock in the same nursery will be injured, thus



Propagation by budding, showing budding-knife, bud-stick, and bud cut and inserted.

showing that the wood of many seedling trees is more tender than that of the propagated varieties. With this fact in view, the grafted tree should prove more successful in the colder sections of the Province. In general, however, there is little to choose between the two for planting in the average district.

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This circular has been prepared by M. S. Middleton, Provincial Horticulturist and Inspector of Fruit Pests.

Copies of this circular may be obtained free of charge on application to the Horticultural Branch, Department of Agriculture, Victoria, B.C., or from local branch offices of the Department.

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